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Case Report

Pancytopenia Induced by Endocrine Dysfunction Following Craniopharyngioma Resection

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Abstract

Pancytopenia is a rare but reversible complication of endocrine dysfunction. We present a case of a 59-year-old female with adrenal insufficiency and hypothyroidism secondary to craniopharyngioma resection who developed progressive pancytopenia. Extensive evaluation ruled out infection, medication effects, and hematologic malignancy. Suboptimal glucocorticoid replacement was suspected. Following stress-dose hydrocortisone, her blood counts improved significantly. This case highlights the need to consider adrenal insufficiency as a potential cause of pancytopenia and underscores the importance of timely, individualized hormone replacement in patients with hypopituitarism, especially during acute stress.

Keywords: Pancytopenia; Hypopituitarism; Adrenal insufficiency; Cortisol replacement therapy; Craniopharyngioma

Introduction

Clinical presentation

A 59-year-old female presented to the emergency department with dizziness and hypoglycemia persisting for two months. Upon initial evaluation, she was hemodynamically stable, and intravenous fluids and dextrose were administered to stabilize her condition. Her medical history was significant for craniopharyngioma, which had been treated with craniotomy and led to long-term hypothalamic-pituitary dysfunction. This included diabetes insipidus, adrenal insufficiency, and hypothyroidism, which were managed with desmopressin, hydrocortisone, and levothyroxine, respectively. Additional past medical history included osteoporosis, managed with raloxifene. Her hospital stay was prolonged due to the need for additional support and resources related to housing insecurity.

Initial workup and findings

An electrocardiogram showed diffuse T-wave inversion in the anterolateral and inferior leads, but the patient did not report chest pain, shortness of breath, palpitations, or abdominal pain. Initial laboratory workup showed no significant leukocytosis, though a mild left shift in the White Blood Cell count (WBC) was noted.

The patient developed a fever three days after presentation (39.3°C/102.8°F) and was accompanied by unstable blood pressure (initially 157/64 mmHg, dropping to 107/52 mmHg). Despite a negative respiratory viral panel, the patient was empirically started on antibiotics (amoxicillin and clavulanate potassium), which resolved the fever. Further investigation was pursued and workup for infection was negative.

Development of pancytopenia

By hospital day 21, a mild pancytopenia was noted (WBC 3.17 K/mcL, HGB 11.6 g/dL, platelets 142 × 10(3)/mcL). By hospital day 24, the patient's platelet count began to drop more significantly, reaching 79 × 10(3)/mcL, and then 64 × 10(3)/mcL on day 26, and 58 × 10(3)/mcL on day 27. Hemoglobin (HGB) and Hematocrit (HCT) also declined during this period, from 12.1g/dL to 9.8g/dL, and 36.2% to 29.3%, respectively. A peripheral blood smear performed on day 24 revealed Burr cells, and further laboratory investigation indicated normal LDH and bilirubin levels, suggesting hemolysis was not the underlying cause.

As the patient's blood counts continued to decrease, bone marrow suppression was suspected. A thorough evaluation ruled out infections (including negative viral panels), and the patient's medication profile did not provide a clear etiology for the pancytopenia. Given the patient's complex endocrine history, it became crucial to explore potential endocrine causes of hematologic abnormalities.

Endocrine evaluation and management

The patient's underlying pituitary dysfunction, resulting from craniopharyngioma resection, was suspected to be a contributing factor to the observed pancytopenia. With partial hypopituitarism, the patient's adrenal insufficiency had been managed with hydrocortisone, but it was suspected that the current dosing may not have been sufficient for the full extent of her physiological needs, especially in the current time of stress.

Reevaluation of the patient's cortisol replacement therapy suggested that inadequate cortisol levels might have exacerbated her bone marrow suppression. On day 26, hydrocortisone was adjusted to a physiological dose (a 100 mg bolus dose with 10mg twice a day), leading to a marked improvement in the patient's white blood counts

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within 48 hours (from 2.79 to 3.72 K/mcL). Additionally, absolute neutrophil count had improved from 0.89 × 10(3)/mcL to 2.29 × 10(3)/mcL, along with a normalization of the platelet count from 58 × 10(3)/mcL to 132 × 10(3)/mcL. This indicated a direct relationship between adrenal insufficiency and the pancytopenia, further supporting the hypothesis that the underlying endocrinopathy played a central role in the patient's hematologic dysfunction.

Endocrine considerations

The patient's partial hypopituitarism, which resulted from the surgical resection of the craniopharyngioma, left her with a complex endocrine profile that contributed to both hypothyroidism and partial adrenal insufficiency. These deficiencies, if inadequately treated, can have a profound impact on various physiological systems, including hematopoiesis.

In this case, the insufficient replacement of cortisol, despite ongoing hydrocortisone therapy, led to an impaired bone marrow response. Cortisol has a known role in maintaining hematopoietic function, and the patient's low cortisol levels likely contributed to the observed pancytopenia, including a decrease in platelets, hemoglobin, and white blood cells.

As the patient's cortisol therapy was optimized, improvements were seen not only in her blood counts but also in her blood pressure and overall clinical status. By hospital day 31, the patient's laboratory results were progressively improving, with a normalized WBC count of 5.10 K/mcL, platelet count of 132 × 10(3)/mcL, HCT of 32.1%, HGB of 10.9 g/dL, and RBC of 3.77 × 10(6)/mcL. This response further supports the hypothesis that the underlying endocrinological disorder was a major contributor to the patient's hematologic abnormalities.

Discussion

Hypopituitarism following craniopharyngioma resection is a well-documented consequence of surgical intervention, primarily due to the tumor's proximity to the hypothalamic-pituitary axis. The pituitary gland, responsible for regulating multiple endocrine functions, is often compromised either directly from tumor invasion or as a result of surgical trauma, leading to deficiencies across several hormonal axes. The major pituitary axes affected postoperatively include the Hypothalamic-Pituitary-Adrenal (HPA) axis, the Hypothalamic-Pituitary-Thyroid (HPT) axis, and the Hypothalamic-Pituitary-Gonadal (HPG) axis. Deficiencies in the HPA axis result in adrenal insufficiency, manifesting as fatigue, hypotension, and, in severe cases, life-threatening adrenal crises. HPT axis dysfunction leads to hypothyroidism, contributing to metabolic slowing, anemia, and cardiovascular complications. Additionally, HPG axis impairment causes reproductive hormone deficiencies, leading to symptoms such as infertility, osteoporosis, and decreased quality of life [1]. Given these profound endocrine disruptions, timely and comprehensive postoperative hormone replacement therapy is essential to mitigate complications and restore physiological stability. Moreover, long-term hormone replacement necessitates periodic reevaluation, as the patient's endocrine needs may evolve over time, especially during times of stress, such as infection or surgery. Chronic hydrocortisone and levothyroxine therapy, for example, require careful dose adjustments to avoid under or over-replacement, which can have deleterious effects on metabolic and hematologic homeostasis. This underscores the necessity of lifelong endocrinological follow-up in patients who have undergone craniopharyngioma resection, ensuring that endocrine deficiencies are adequately managed and that potential late-onset complications, such as pancytopenia, are promptly addressed.

This case highlights the critical role of cortisol in maintaining hematologic function and the significant impact that endocrine dysfunction, particularly adrenal insufficiency, can have on bone marrow activity. The patient's history of craniopharyngioma resection and subsequent hypopituitarism likely led to an adrenal insufficiency that was inadequately treated, contributing to pancytopenia. Although the patient had been receiving hydrocortisone, the dose was insufficient to support her body's physiological needs during stress, resulting in bone marrow suppression.

Adrenal insufficiency has been linked to pancytopenia in patients with pituitary dysfunction, as cortisol is essential for maintaining bone marrow health. In rare cases, pancytopenia results from hormonal deficiencies that arise in the setting of panhypopituitarism [2]. This case emphasizes the importance of assessing and adjusting endocrine replacement therapies in patients with complex endocrinopathies, particularly in the context of pituitary dysfunction following surgery or radiation therapy for tumors like craniopharyngiomas.

Furthermore, the relationship between hypopituitarism and pancytopenia has been documented in a few clinical scenarios. For instance, a case report described a patient with panhypopituitarism secondary to a pituitary macroprolactinoma who presented with pancytopenia, which improved upon appropriate hormone replacement therapy [3]. Similarly, another report highlighted a case of pancytopenia due to isolated ACTH deficiency that was successfully treated with hydrocortisone replacement [4]. These cases illustrate the reversible nature of hematologic abnormalities when underlying endocrine deficiencies are adequately addressed.

In the context of craniopharyngioma, postoperative complications often include hypopituitarism, which can manifest as various hematologic abnormalities, underscoring the need for vigilant endocrine evaluation and management in these patients.

Conclusion

This case report demonstrates the importance of recognizing and treating underlying endocrine dysfunctions, particularly adrenal insufficiency, in patients with pituitary or hypothalamic disorders. In patients with complex endocrine histories, such as those following craniopharyngioma resection, close attention must be paid to cortisol replacement, as insufficient doses can lead to significant hematologic abnormalities, including pancytopenia. The patient's response to optimized cortisol replacement therapy highlights the importance of a comprehensive approach to managing endocrine dysfunction in the context of hematologic complications.

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